

## ***INVESTMENT***

- Investment is the most volatile component of GDP
  - Fluctuations in the economy's output
- Why is investment negatively related to the interest rate?
- What causes the investment function to shift?
- Why does investment rise during booms and fall during recessions?

### **1. Three Components of Investment**

- 1) Business fixed investment: the equipment and structures that business buy to use in production
- 2) Residential investment: new housing that people buy to live in and that landlords buy to rent
- 3) Inventory investment: those goods that businesses put aside in storage, including materials and supplies, work in process, and finished goods

## 2. Business Fixed Investment

### (1) *The neoclassical model of investment*

- Examines the benefits and costs to firms of owning capital goods

→  $I = f(\text{MPK, interest rate, tax rules})$

#### 1) The rental price of capital (production firm)

- Real cost of a unit of capital to production firm  
=  $R/P$

where  $R$ : rental rate,  $P$ : the price of firm's product

- The real benefit of a unit of capital  
= The extra output produced with one more unit of capital (MPK)

#### 2) The cost of capital (rental firm)

- The real cost of capital (The cost of buying and renting out a unit of capital measured in units of the economy's output)  
=  $(P_K / P)(r + \delta)$

where  $P_K$ : the purchase price of a unit of capital,  
 $\delta$ : the rate of depreciation (the fraction of value lost per period b/c wear and tear)  
 $r$ : real interest rate

### 3) The determinants of investment

→ A rental firm's decision about whether to increase or decrease its capital stock

- Profit rate (real profit per unit of capital)

$$= \text{Revenue} - \text{Cost}$$

$$= R/P - (P_K/P)(r + \delta)$$

$$= MPK - (P_K/P)(r + \delta)$$

- The rental firm's decision depends on whether owning and renting out capital is profitable.

→ The change in capital (*net investment*) depends on the difference b/t MPK and the cost of capital

MPK > cost of capital → add to their capital stock

MPK < cost of capital → let their capital stock shrink

→ Investment function (fig. 17-3)

$$I = f[MPK - (P_K/P)(r + \delta)] + \delta K$$

$$(b/c \Delta K = f[MPK - (P_K/P)(r + \delta)] \text{ and } I = \Delta K + \delta K)$$

### 4) Tax and Investment

- Tax law influence firms' incentives to accumulate capital in many ways
- Corporate income tax: a tax on corporate profit
- Investment tax credit

## (2) *The Stock Market and Tobin's q*

- A link between fluctuations in investment and fluctuations in the stock market
- Stock prices reflect the incentives to invest
  - Stock prices tend to be high when firms have many opportunities for profitable investment, because these profit opportunities means higher future income for the shareholders
- Tobin's  $q$ 
$$q = \frac{\text{market value of installed capital}}{\text{replacement cost of installed capital}}$$
  - numerator → the value of the economy's capital as determined by the stock market
  - denominator → the price of the capital if it were purchased today
- Net investment decision
  - $q > 1$  → raise the market value of firms' stock by buying more capital
  - $q < 1$  → will not replace capital as it wears out
- Advantage of Tobin's  $q$ 
  - reflects the expected future profitability of capital as well as the current profitability

### 3. Residential Investment

- Shifts in the demand for housing
  - Changes in equilibrium price of housing
  - Change in residential investment
- An economic boom (national income ↑)
- A large increase in the population
- The real interest rate (e.g., mortgages)  
(b/c the interest rate = the cost of the loan)

### 4. Inventory Investment

#### *(1) Reasons for holding inventories*

- Production Smoothing
  - e.g., When sales are low, the firm produces more than it sells and put the extra goods into inventory
- Inventories as a factor of production
  - The larger the stock of inventories a firm holds, the more output it can produce
- Stock-out avoidance
  - Avoid running out of goods when sales are unexpectedly high
- Work in process
  - b/c a number of steps in production

## (2) *The Accelerator Model of Inventories*

- Assumption: Firms hold a stock of inventories that is proportional to the firm's level of output

e.g., When output is high, firms need more materials and supplies on hand

$$\rightarrow N = \beta Y$$

where  $N$ : the economy's stock of inventories

$\beta$ : a parameter reflecting how much inventory firms wish to hold as a proportion of output

- Inventory investment: the change in the stock of inventories

$$\rightarrow I = \Delta N = \beta \Delta Y \quad (\text{fig. 17-7})$$

where  $\Delta Y$ : the acceleration of production

$\rightarrow$  *Inventory investment depends on whether the economy is speeding up or slowing down*

## (3) *Inventories and the Real Interest Rate*

- When a firm holds a good in inventory and sells it tomorrow

$\rightarrow$  it gives up the interest rate it could have earned b/t today and tomorrow

- If real interest rate  $\uparrow$

$\rightarrow$  holding inventories becomes more costly

$\rightarrow$  reduce their stock

# ***MONEY SUPPLY AND MONEY DEMAND***

- The supply of money and demand for money are crucial to many issues in macroeconomics
  - How the central bank controls the quantity of money
  - How monetary policy affects prices and interest rates in the LR (classical theory)
  - How monetary policy affects output and interest rates in the SR (IS-LM model)

## **1. Money Supply**

- Money Supply ( $M$ )  
= Currency ( $C$ ) + Demand Deposit ( $D$ )
- Reserves: the deposits that banks have received but have not lent out

### *(1) 100-Percent-Reserve Banking*

- All deposits are held as reserves  
i.e., Banks accept deposits, place the money in reserve, and leave the money there until the depositor makes a withdrawal

## (2) *Fractional-Reserve Banking*

- A system under which banks keep only a fraction of their deposits in reserve
  - Banks use some of their deposits to make loans (banks can charge interest on the loans)
  - Banks create money

Ex) the process of money creation

Assuming that the reserve-deposit ratio is constant,

Original deposit = \$ 1,000

1<sup>st</sup> bank lending =  $(1 - rr) \times \$1,000$

2<sup>nd</sup> bank lending =  $(1 - rr)^2 \times \$1,000$

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Total Money supply =

$$[1 + (1 - rr) + (1 - rr)^2 + \dots] \times \$1,000 = (1 / rr) \times \$1,000$$

- each \$1 of reserves generate  $\$(1 / rr)$  of money
- Only banks have the legal authority to create assets that are part of the money supply
- Banks are the only financial institutions that directly influence the money supply



### (3) A Model of the Money Supply

- Examine how Fed policy, the choice of banks, and households decision influence the money supply
- Exogenous variables
  - Monetary base ( $B$ ) = currency ( $C$ ) + reserves ( $R$ )  
→ directly controlled by the Fed.
  - Reserve-deposit ratio ( $rr$ )  
→ determined by the business policies of banks
  - currency- deposit ratio ( $cr$ )  
→ reflects the preference of households about the form of money they wish to hold
- Since  $M = C + D$  and  $B = C + R$ ,

$$\frac{M}{B} = \frac{C + D}{C + R} \rightarrow \frac{M}{B} = \frac{C/D + 1}{C/D + R/D} = \frac{cr + 1}{cr + rr}$$
$$\rightarrow M = \frac{cr + 1}{cr + rr} \times B = m \times B$$

where  $m$  is the money multiplier.

i.e., each dollar of the monetary base produces  $m$  dollars of money

- Implications

- The money supply is proportional to the monetary base
- The lower Reserve-deposit ratio ( $rr$ ), the more loans banks make, and the more money banks create from every dollar of reserve
- The lower currency-deposit ratio ( $cr$ ), the fewer dollars of the monetary base the public holds as currency, the more base dollars banks hold as reserves, and the more money banks can create

(4) *Three Instruments of Monetary Policy*

- Open-market operations: the purchases and sales of government bonds by the Fed.

If the Fed buys bonds from the public

$\rightarrow B \uparrow \rightarrow M^s \uparrow$

- Reserve requirements: Fed regulations that impose on banks a minimum reserve-deposit ratio

If reserve requirements  $\uparrow \rightarrow rr \uparrow \rightarrow m \downarrow \rightarrow M^s \downarrow$

- Discount rate: the interest rate that the Fed charges when it makes loan to banks.

If Discount rate  $\uparrow \rightarrow$  loan from Fed  $\downarrow \rightarrow B \downarrow \rightarrow M^s \downarrow$

## 2. Money Demand

- The quantity theory of money:  $(M / P)^d = kY$

↓

- $(M / P)^d = L(r, Y)$

↓

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### (1) *Portfolio Theories of Money Demand*

- Emphasize the role of money as a store of value
  - People hold money as part of their portfolio of asset
- i.e., money offers a safe return (no risk), whereas the prices of stock and bonds may rise or fall (risky)
  - Households choose to hold money as a part of their *optimal* portfolio
- Money demand function:  $(M / P)^d = L(r_s, r_b, \pi^e, W)$ 
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where  $r_s$ : the expected real return on stock

$r_b$ : the expected real return on bond

$\pi^e$ : the expected inflation rate

$W$ : real wealth

→ Although the portfolio approach to money demand may not be plausible when applied to M1, it may be a good theory to explain the demand for M2 or M3

## (2) *Transaction Theories of Money Demand*

- Emphasize the role of money as a medium of exchange
  - Money is a dominated asset b/c people hold money, unlike other assets, to make purchase
  - best explain why people hold narrow measures of money (M1)
  
- Money has the cost of earning a low rate of return and the benefit of making transactions more convenient
  - People decide how much money to hold by trading off these costs and benefits
  
- Baumol-Tobin model of Cash Management
  - The benefit of holding money: “convenience”
  - The cost of holding money: “the foregone interest they would have received”
  
  - They show that money demand depends positively on expenditure (income) and negatively on the interest rate ( $L(r, Y)$ )